DOCUMENT RESUME

ED 413 132 RC 021 216

AUTHOR Knapp, Doug
TITLE Evaluating the Impact of Environmental Interpretation: A Review of Three Research Studies.
PUB DATE 1996-00-00
NOTE 11p.; In: Coalition for Education in the Outdoors Research Symposium Proceedings (3rd, Bradford Woods, Indiana, January 12-14, 1996); see RC 021 207.
PUB TYPE Information Analyses (070) -- Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Attitude Change; Behavior Change; Elementary Education; Elementary School Students; *Environmental Education; *Knowledge Level; Models; Outcomes of Education; Program Evaluation; *Student Attitudes; Teacher Education
IDENTIFIERS *Environmental Attitudes; Environmental Awareness; Indiana University; *Interpretation (Environmental)

ABSTRACT

Three research studies examined the impact of environmental interpretation programs on the environmental knowledge, attitudes, and behaviors of student participants. Conducted by Indiana University's Department of Recreation and Park Administration, the studies evaluated variables related to entry level (awareness), ownership, and empowerment goals in a behavior change model of environmental interpretation. In the first study, approximately 600 students in grades 3-4 participated in the Hilltop Interpretation Project during half-day field trips to the Hilltop Garden and Nature Center (Bloomington, Indiana). In the second study, approximately 1,600 urban students in grades 4-5 participated in two interpretive field trips to Indiana Dunes National Seashore, one focused on ecology awareness and the other on awareness of environmental issues. In the third study, a partnership of educational institutions in south-central Indiana sponsored a year-long five-phase environmental education program for middle school teachers and students intended to promote involvement in the management of the heavily utilized Charles Deam Wilderness. Results of pre- and posttests indicate that entry-level variables had more short-term impact on students than ownership and empowerment variables. All interpretive experiences based on ecological information increased student knowledge, but only the ecological field trip at Indiana Dunes affected student attitudes and behavioral intentions. Interpretive experiences with ownership and empowerment variables had no effect on student attitudes and behavior. (SV)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 413 132

EVALUATING THE IMPACT OF ENVIRONMENTAL INTERPRETATION: A REVIEW OF THREE RESEARCH STUDIES

Doug Knapp
Assistant Professor
Indiana University

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Charles H Yaple
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC).

RC 021216

BEST COPY AVAILABLE

Evaluating the Impact of Environmental Interpretation: A Review of Three Research Studies

Doug Knapp
Assistant Professor
Indiana University

This paper reviews three research studies that looked at the impact an interpretive experience has on knowledge, attitude, and/or behavior of a park visitor. research methodologies, limitations, and conclusions were discussed for all three studies.

KEYWORDS: *Environmental interpretation, evaluation, environmental education, knowledge/-attitude/behavior change*

INTRODUCTION

The fifth principle of interpretation defined by Freeman Tilden is to provoke visitors to become preservationists of the park they visit (Tilden, 1957). This lofty goal is supported by a significant proportion of interpreters and will be used by the author to define environmental interpretation.[1] Despite the interest and importance of this particular interpretive endeavor, the field has lacked an established framework of goals to achieve this behavior change.

Several studies have been conducted in the related field of environmental education to analyze and identify key variables that are associated with attitude/behavior change. Research conducted by Borden and Powell (1983), Hines (1987), Holt (1988), Hungerford and Volk (1990), Marcinkowski (1989), and Sia, Hungerford, and Tomera (1985/86) revealed that there are probably three categories of variables that contribute to environmental behavior: entry level, ownership and empowerment variables.

Combining the above research with a synthesis of over 100 goals and objectives of interpretation, the author produced a framework of goals and objectives for environmental interpretation. This framework was evaluated and supported by a panel of interpretive leaders throughout North America. The result of this validation process is the Environmental Interpretation Behavior Change Model (Knapp, 1994) illustrated in Figure 1.

The most powerful use of this model is to offer interpretive experiences that include all three variable levels in a sequential hierarchical order. Although this may not assure attitude or behavior change in the visitor, it does offer opportunities to stimulate change. It is important to note that, with the exception of issue investigation goals, all of the directives listed in the above model are outcomes often found in the interpretive literature.

The development of this model is an attempt to offer to the field a "road map" to achieve knowledge, attitude, and/or behavior change in a park visitor. It is a framework in which the field can attempt to evaluate which variables are more successful in achieving this behavior change goal. For the past three years, Indiana University's Department of Recreation and Park

[1] A communication process for revealing meanings and information of natural resources and their relationships with man with an ultimate aim of changing a visitor's behavior toward the resource site and beyond.

Doug Knapp, Ph.D., is an Assistant Professor in the Department of Recreation and Park Administration at Indiana University, Bloomington, IN 47405; (812) 855-3094; fax (812) 855-3998.

RC 021216

Entry Level Goals
Ownership Goals
Empowerment Goals
• Information / Awareness of Site
• Understanding of Site
• Awareness of Site Policies
• Environmental Sensitivity
• Resource Site Issue Awareness
• Resource Site Issue Investigation and Evaluation
• Promote Positive / Responsible Environmental Actions
Visitor Behavior Change

Figure 1. Environmental Interpretation Behavior Change Model

Administration has been conducting three multi-year research studies to evaluate one or more of the variables outlined in the behavior change model. The remainder of this paper will summarize the methodologies and results of the first year of these evaluations.

THE HILLTOP INTERPRETATION PROJECT

Purpose of Study

The primary goal of the Hilltop Interpretation Project was to evaluate the impact an ecological interpretive program has on the environmental knowledge, attitude, and/or behavior of third and fourth grade students. This represents the first goal level of the Environmental Interpretation Behavior Change Model.

A second goal of the Hilltop Interpretation Project was to enable urban and rural children in south central Indiana to participate in environmental/conservation education programs at the Hilltop Garden and Nature Center. This facility is located in the city of Bloomington on the campus of Indiana University.

Methods and Procedures

The Hilltop Interpretation Project offered several innovative approaches toward the development, application, and evaluation of environmental interpretation. An outline of these procedures follows:

Selection of Program

Through a series of meetings with participating school teachers and agency officials, an interpretive program was developed that answered the needs of the teachers' class curricula. The actual experiences and activities used in these programs were taken from existing environmental/conservation resources such as Project Learning Tree, Project Wild, and OBIS (Outdoor Biological Instructional Strategies). The subject matter contained in the interpretive experience focused on plant adaptations. This was an important science concept that both the third and fourth grade students were learning through the Science Curriculum Improvement Study (SCIS).

Program Implementation

During the fall and spring of the 1993-94 school year, approximately 30 third and fourth

grade classes (600 students) from south central Indiana participated in conservation/environmental education activities at the Hilltop Interpretive Center. These interpretive programs, which lasted for a half day, were led by an environmental education specialist.

Prior to the field trip, each participating teacher was required to take part in a day-long training that accomplished two objectives. First, all pre and post lessons to be implemented by the teacher were offered in a participatory fashion. Second, the educators were made aware of the research associated with this program and the evaluation instrument teachers would administer to students.

Program Evaluation

An evaluation of the classes' participation in these interpretive programs took place from the onset of their experience. A quasi-experimental design was used to conduct this research. This field research model approximates the conditions of a true experiment in a setting which does not allow for control of all variables (Isaac and Michael, 1990). A test was administered to students prior to any pre-field trip lessons. A pre-visit test was given before their visit to the Hilltop facility and a post-test was administered to students at the school following the experience. These evaluations, which were approved by the teachers, measured any knowledge and/or attitude change that resulted from students' participation in the interpretation program at Hilltop.

The Hilltop Interpretation Project had two distinct phases—the fall and spring evaluation sessions. The fall semester was considered a pilot study; it evaluated approximately 230 third and fourth graders' experiences at Hilltop. The evaluation instrument used for the pretest, pre-visit test, and post-test was revised following the pilot study during the fall semester. This instrument was a partial replication of evaluation tools designed by the National Science Resources Center (1993) to measure knowledge and attitude changes in elementary school students. This instrument contained nine multiple choice and true/false questions. The revised instrument and evaluation process were then administered during the spring semester.

During the spring semester, over 300 third and fourth grade students participated in the Hilltop Interpretation Project. Each student completed a pretest, pre-visit test, and post-test. A chi-square analysis was conducted on the multiple choice questions due to the nominal data. This analysis determined if a relationship existed between the time the students took the test and the responses they selected. F tests were run on the true/false questions to determine if there were any significant changes in scores between the first, second, and third tests.

Conclusions and Discussion

The results show significant changes in students' knowledge of plant adaptations after their interpretive experience. All knowledge-related questions showed some significant increase in scores following the Hilltop program. The attitude related questions showed no significant difference. These data support the notion that an interpretive experience can aid student's awareness in science/ecological subject matter. It does not support the notion that such a short experience can affect student's attitude toward that subject matter.

INDIANA DUNES NATIONAL LAKESHORE/ INDIANA UNIVERSITY ENVIRONMENTAL EDUCATION PARTNERSHIP

Purpose of Study

The primary goal of the first year of this two year study was to evaluate impacts that two separate environmental interpretive programs have on students' environmental knowledge, attitude and/or behavior. This project provided two environmental interpretative field trips to approximately 1600 fourth and fifth grade urban students. Second, it provided environmental education training to the 65 participating teachers. A third outcome of this project yielded an intensive evaluation of students' interpretive experiences. This evaluation compared the effects of two different programs representing two

variable levels of the Environmental Interpretation Behavior Change Model: awareness of ecology and environmental issue awareness.

Methods and Procedures

Selection of Programs

During the summer of 1994, representatives of Indiana University worked closely with staff at the Paul H. Douglas Environmental Education Center, at Indiana Dunes National Lakeshore, to determine which programs currently being offered at the Douglas Center would be suitable for inclusion in the study. After a thorough examination, "Fall Fanfare" was chosen as the ecology-based program. This program focused on preparations and adaptations animals and plants make to survive the winter. Objectives of the program were met through a series of activities on a guided walk through a forested dune area.

The "Celebration Earth" presentation was chosen as the issue-oriented program. Through a series of four activities conducted at the Douglas Center, students were presented with problems of and possible solutions to water pollution. The programs were designed by the National Park Service staff at the Douglas Center and have been presented to thousands of students over the past ten years.

Program Implementation

At the beginning of the 1994-95 school year, 65 teachers (representing approximately 1600 students) from the Duneland, East Chicago, and Gary, Indiana school districts were contacted and asked to participate in a study that would provide the opportunity to attend fall and spring workshops. The teachers were also informed that their classes would be able to participate in ranger-guided fall and spring environmental interpretation field trips.

At the day-long training workshops teachers participated in programs their students would be attending later in the semester. Pre-site and post-site activities developed by the National Park Service were demonstrated for teachers in a hands-on presentation. Teachers signed up for field trips during the workshop insuring that each class would be able to participate at a time convenient to their schedule. Evaluation instruments, testing forms, and return envelopes were provided to teachers to facilitate high response rates for the program evaluations.

Program Evaluation

To evaluate the impact the programs had on students' knowledge, attitudes, and behavior toward the environment, a quasi-experimental design (Isaac and Michael, 1990) was implemented using an evaluation instrument that included fifteen matching, multiple choice, and Likert scale questions. This was a replication of an evaluation tool developed by Drake and Knapp (1994) and the National Science Resources Center (1993). During the fall, teachers administered the test before they began pre-site activities (the initial test), before the class attended the "Fall Fanfare" program (the pre-test), and after the class attended the program (the post-test). All tests in the study were given in the classroom and then sent to Indiana University for analysis.

During the spring teachers were asked to administer the test twice, once before the "Celebration Earth" program (the pre-test) and once after the "Celebration Earth" program (the post-test). The evaluation instrument remained the same throughout the fall and spring sessions. A majority of teachers administered the evaluation which provided a large sample of student responses for analysis. Two teachers volunteered to act as control groups.

T-tests for independent samples was used to analyze the Likert scale and matching questions which measured any attitude and/or knowledge change. This analysis was chosen to determine if the difference in responses over time was significant. It was also chosen due to the variability in teacher consistency in returning the evaluations. A chi-square analysis was conducted on the multiple choice questions due to the nominal data. This analysis determined if a relationship existed between the time the students took the test and the responses they selected.

TABLE 1

Significant Results from Indiana Dunes Study

Ecology-Based Interpretive Program	Issue-Based Interpretive Program
• Positive increase in attitude toward Indiana Dunes (between initial test and pre-test only).	• Decrease in positive attitude toward the Indiana Dunes.
• Positive increase in attitude toward staying on marked trails.	• Decrease in positive attitude toward staying on marked trails.
• All ecology-based questions (5) showed significant positive increases.	• No positive increase in ecology scores but higher pre-test means than in fall.
• More students moved toward organizing protest to protect park.	• Fewer students would form petitions to protect park.
• Positive increase in attitudes toward the forests.	• Fewer students would organize friends to take action to protect park.
• More students would attend guided park walks.	• Fewer students would attend guided park walks.

Conclusions and Discussion

Conclusions

Table 1 shows a summary of significant results found in this study. These results tend to suggest that an ecology-based program produce more immediate positive changes in students' knowledge, attitudes, and behavior intent than an issue-oriented program. The analysis of the fifteen question evaluation instrument revealed ten favorable changes and no unfavorable changes in relation to the ecology-based program. There were no positive changes and five unfavorable changes associated with issue-based presentation.

Discussion

There were several limitations related to this study that must be reviewed. First, the evaluation instrument only measured short-term retention. The pre and post-tests were administered within one to two weeks prior to and after the field trips. This was done to alleviate other variables from influencing student responses and to isolate the immediate impact of the field trip. Therefore, this analysis of short term effect cannot support actual behavior change. Rather, this study can report on behavior intent through the pre and post-test evaluation.

Another important limitation was that the fall interpretive experience was conducted in the outdoors where as the spring session was conducted primarily indoors. Although the spring session contained hands-on experiences for students, the possibility does exist that negative results from this session were motivated by lack of outdoor activities. If this limitation is valid, it should still be noted there was a clear difference in students' reaction to indoor vs. outdoor interpretive experiences.

These limitations must be considered when interpreting the results of the first year of this study. This research does not completely validate ecological-based programs nor does it negate the importance of issue-based interpretive experiences. Several changes in the research will take place during the second year to increase the validity of the evaluation instrument and application of the interpretive programs. These changes will produce a more accountable study.

SOUTH CENTRAL INDIANA ENVIRONMENTAL EDUCATION PARTNERSHIP PROJECT

Purpose of Study

The primary goal of the South Central Indiana Environmental Education Partnership Proj-

ect was to evaluate effects of interpretive programs on students' environmental knowledge, attitudes, and/or behavior. This partnership represents all of the goal levels associated with the Environmental Interpretation Behavior Change Model outlined at beginning of this paper. The South Central Indiana Environmental Education Partnership Project was composed of three primary institutions. They were:

- Indiana University–Department of Recreation and Park Administration
- United States Forest Service–Hoosier National Forest
- Monroe County Community School Corporation

This project formed a partnership with the region's educational institutions to provide environmental education to middle school teachers and students and to promote their involvement in the management of Charles Deam Wilderness. This site, located in south central Indiana, is one of the most utilized wilderness areas in the country.

Methods and Procedures

Selection of Programs

To accomplish the partnership's objectives, five environmental interpretive programs or phases were developed to integrate into middle school curricula during the academic year. Each phase included one teacher training day, an interpretive field trip, and related classroom lessons.

The program was intended to be used with science and social studies curricula creating a year-long environmental education program. Below is a brief description of each phase of the program:

- *Phase #1–Basic Knowledge of Wilderness Site:* Focused on basic ecological principles regarding south central Indiana ecosystems, as well as the natural and cultural history of the Deam Wilderness.
- *Phase #2–Awareness of Problems and Issues Related to Wilderness Site:* Students learned about problems and issues associated with the Deam Wilderness by analyzing some wilderness site issues.
- *Phase #3–Investigation of Wilderness Site Issues:* Strategies and methods were planned so that students could investigate Deam Wilderness issues.
- *Phase #4–Knowledge of Citizen Participation Skills:* Students determined implementation strategies to remediate the wilderness issues.
- *Wilderness Summit:* All of the participating students met with U.S. Forest Service officials to report recommendations regarding management of the Deam Wilderness.

Program Implementation

Each of the above program phases included teacher training and classroom lessons as well as an interpretive aspect such as a field trip or class visit by a Forest Service/Indiana University Interpreter. These programs represented one full school year with phases one and two occurring in the fall semester and phases three and four in the spring semester. Five teachers, representing 150 middle school students, were chosen to take part in this project.

Program Evaluation

Below are two areas that were evaluated in this project:

- Does the partnership project affect students' knowledge, attitudes, and/or behaviors toward the Deam Wilderness and related environmental issues?
- Which one of the environmental education phases has the most impact (if any) on students' knowledge, attitudes, and/or behaviors toward the Deam Wilderness and related environmental issues?

To investigate these questions, a quasi-experimental design (Isaac & Michael, 1990) was implemented which included an evaluative instrument developed by Indiana University. This took the form of a series of pre- and post-tests administered to all participating students.

TABLE 2

Timing and Placement of Evaluations

	Pre-Evaluation	Pre-Evaluation	Pre-Evaluation	Pre-Evaluation	
General Pre-test	**Phase #1**	**Phase #2**	**Phase #3**	**Phase #4**	General Posttest
	Post-Evaluation	Post-Evaluation	Post-Evaluation	Post-Evaluation	

These evaluations were approved by the teachers and measured any knowledge and/or attitude change due to their participation in this environmental education project. This evaluation was a modification of instruments developed by Ramsey (1981), Klingler (1981), and Drake and Knapp (1994). This was a 20-item instrument that used Likert scale and multiple choice questions. Table 2 shows a chart that illustrates the placement of these evaluations.

The general pre- and post-test was an attempt to answer the first area of importance to this study—does the project as a whole make any impact on students' knowledge and/or attitudes toward the Deam Wilderness issues? The pre and post evaluations for all phases attempted to find out which part of the program had the most impact. Each question was analyzed by using a matched pairs t-test to determine if the difference in responses over time was significant.

Another important aspect of this project was the qualitative evaluation. Through first-hand observations, the research team was able to determine a great deal about students' knowledge, attitudes, and behavior with respect to the Deam Wilderness. The Indiana University educators also conducted a series of interviews with the participating classroom teachers during and after the partnership project.

Conclusions and Discussion

Conclusions

Of the three variables (knowledge, attitude, and behavior) evaluated through the quantitative measures, only knowledge questions showed significant increases during the year-long program. In fact, this increase occurred primarily during the first phase of the partnership project. The attitude and behavior variables did not reflect a significant increase.

The qualitative evaluation also showed mixed findings. The comments from both students and teachers during the first two phases were generally positive. On the other hand, comments from the second two phases showed frustration with students' interest in researching wilderness issues. The most dramatic qualitative results occurred with students' interest in Forest Service officials' statements during the wilderness summit.

Discussion

An important lesson from this project was over-testing of students through quantitative evaluations. It became clear after two phases of testing, students responses were reflecting "test burnout." Another important finding was that future interpretive partnerships should look at semester or month-long experiences. A full school year was too long with both qualitative and quantitative findings showing a decrease in interest.

SUMMARY

The three research studies outlined above are initial attempts to validate or disprove the environmental interpretation "road map" described at the outset of this paper. Many limitations existed in these studies and were discussed with each research summary. Despite these concerns the author believes there are two important observations that can be made regarding these three studies and their bearing on the Environmental Interpretation Behavior Change Model.

1) *Entry level variables showed more short-term impact on students than ownership or empowerment variables.* All three research

studies showed significant increases on students' knowledge of the resource site involved in that particular study. This, however, was only true for the interpretive experiences that were based on ecological information. The Hilltop program, the ecological field trip at Indiana Dunes, and the first phase of the wilderness field trips all showed significant increases in student knowledge. Only the ecological field trip at Indiana Dunes showed any impact in students' attitudes and behavior toward the resource site.

2) *Interpretive experiences with ownership and empowerment variables showed no significant impact on students' attitude and/or behavior intent toward the resource site.* The issue-oriented field trip at Indiana Dunes and the three phases of the Deam Wilderness project that represented ownership and empowerment variables showed no significant impact on students' attitude toward and/or behavior intent regarding the resource site. In fact, some scores showed a decline in attitude and/or behavior toward the resource site following ownership/empowerment experiences.

The first year's results of these three studies indicate that the initial variables of the Environmental Interpretation Behavior Change Model may have impact on a visitor's knowledge of the resource site. However only the Indiana Dunes study found these variables to have impact on a visitor's attitude or behavior. No other significant results were found in any other variable level.

Research supports the notion that short-term awareness experiences do not change an individual's behavior, which is the ultimate goal of environmental interpretation. Unfortunately, the studies reviewed above only support success in conveying knowledge variables. Therefore, an inference from this data would support the notion that environmental interpretation should take a hard look at its lofty goal of provoking a visitor to become a preservationist of his/her resource site. The field must further investigate if and how interpreters can successfully convey ownership and empowerment variables to attempt to achieve the widely espoused behavior change outcome.

REFERENCES

Borden, R., & Powell, P. (1983). Androgyny and environmental orientation: individual differences in concern and commitment. In A. Sacks et al., *Current issues in environmental education and environmental studies* (Vol. VIII, pp. 261-275). Columbus, OH: ERIC/SMEAC.

Drake, T., & Knapp, D. H. (1994). The hilltop interpretation project. *The interpretive sourcebook* (The Proceedings of the 1994 National Interpreters' Workshop). Madison, WI: Omnipress, 282-292.

Hines [Stone], J. M. (1986/87). Analysis and synthesis of research on responsible environmental behavior: a meta-analysis. *Journal of Environmental Education, 18* (2), 1-8.

Holt, J. G. (1988). A study of the effects of issue investigation and action training on characteristics associated with environmental behavior in non-gifted eighth grade students. Unpublished research paper, Southern Illinois University.

Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education, 21* (3), 8-21.

Isaac, S., & Michael, W. B. (1990). *Handbook in research and evaluation.* San Diego, CA: Edits.

Klingler, G. (1981). The effect of an instructional sequence on the environmental action skills of a sample of Southern Illinois students. Unpublished research report, Southern Illinois University.

Knapp, D. H. (1994). *Validating a framework of goals for program development in environmental interpretation.* Unpublished doctoral dissertation, Southern Illinois University, Carbondale.

Knapp, D. H. (1995). Moving beyond Tilden: Producing behavior change goals for environmental interpretation. *Legacy: Journal of the National Association for Interpretation.* January/February, 24-27.

Marcinkowski, T. J., (1989). An analysis of correlates and predictors of responsible environmental behavior. (Doctoral dissertation, Southern Illinois University at Carbondale, 1988). *Dissertation Abstracts International, 49* (12), 3677-A.

National Park Service. (1992). *National parks for the 21st century: The Vail agenda.* Washington D. C.: National Park Service.

National Science Resources Center. (1993). Assessment in STC units. *National Science Resources Center Newsletter*, Spring, 2-3.

Ramsey, J. (1981). The effects of environmental action and environmental case study instruction on the overt environmental behavior. *Journal of Environmental Education, 13* (1), 24-30.

Sia, A. P., Hungerford, H. R., & Tomera, A. N. (1985/86). Selected predictors of responsible environmental behavior: An analysis. *Journal of Environmental Education, 17* (2), 31-40.

Tilden, F. (1957). *interpreting our heritage.* Chapel Hill, NC: University of North Carolina.